

Automation in Lean

Damiano Testa

University of Warwick

May 2nd, 2023

The lemmas that 'simp' uses are "'simp'-lemmas": carefully selected lemmas to have, among others, two basic features

- * they assert an equality or an iff;
- * the LHS *looks more complicated* than the RHS.

```
#print one_mul:      -- shortened output:      1 * a = a
#print zero_mul:     -- shortened output:      0 * a = 0
#print add_zero:     -- shortened output:      a + 0 = 0
#print neg_neg:      -- shortened output:      - -a = a
#print mul_zero:     -- shortened output:      a * 0 = 0
#print mul_one:      -- shortened output:      a * 1 = a
#print neg_mul:      -- shortened output:      -a * b = -(a * b)
```

The asymmetry helps Lean: it only tries to apply the lemmas in the direction hard